City of Lafayette Staff Report

For:	City Council
By:	Ann Merideth, Community Development Director Ron Lefler, Public Works Services Manager
Date Written:	October 15, 2008
Meeting Date:	October 27, 2008
Subject:	Drought response and water well feasibility study

Summary

The City Council discussed the City's water conservation efforts on June 9, 2008. This discussion was in response to EBMUD's rationing goals. The attached report provides a brief update on the City's conservation goals. The report also provides a feasibility study on the use of water wells at the Community Park as a cost-effective alternative to EBMUD water for irrigation. This study was completed this summer by a Public Works student intern, and, based on its findings, staff recommends that the City proceed with further investigation into this alternative source of water.

This investigation will have two steps. First, ground imaging will be undertaken at a cost of $14,500. If the imaging produces positive results, permits will be obtained and test drilling will occur at a cost of $28,950. If the imaging is not positive, test drilling will not occur. Funding for these two steps will come from Emergency Response, 11-360. This fund has $307,000 of which $257,000 was for the St. Mary's Road and Pleasant Hill Road slide repairs. However, the slide repair bid price of $135,000 was well below the engineer's estimate, and $122,000 is available for the two-step water well investigation and actual well drilling.

Recommendations

Staff recommends that the City Council direct staff to: 1) proceed with a ground imaging study and, if positive, test drilling at the Community Park; and 2) to report back to Council with the findings of this investigation.

City of Lafayette Memorandum

To: Steve Falk, City Manager

From: Ron Lefler, Public Works Services Manager

Date: October 7, 2008

Subject: Water Well Study, Drought Response

Water Conservation

Based on EBMUD billings for June through August we are meeting our 15% reduction goal, and when considering the total water use for median landscape, R/W landscape and parks we may meet the 30% goal set by EBMUD. This has been accomplished with minor loss of landscaping. We believe our reductions have been greatly assisted by the connection of the weather station at the Corpyard to the central irrigation controller. The weather station automatically adjusts the irrigation schedule on a daily basis with the rise and fall of atmospheric temperatures. Without the weather station irrigation schedules were typically set at the beginning of the month based on historic temperatures for that month.

Landscape Water Sources

- **EBMUD**

Should the drought continue through the 08/09 season it is likely we will be faced with further, more drastic landscape water reductions and possibly no landscape water from EBMUD. We may be able to make further reductions but not with out severe loss of landscape. With no landscape irrigation water only large established shrubs and trees would have the ability to survive.

Given the uncertainty of EMBUD to deliver adequate water in 2009 we need to explore and develop reasonable alternatives to EBMUD as a water source for the City's landscape.

- **Water Wells**

Water wells could provide an excellent option to EBMUD water, both for immediate drought survival and long term water use. Cost of developing water wells can potentially be partially or completely offset by a reduction in EBMUD water cost.

With the effort of our student intern, David Terhune, over the summer with have completed the first phase of a study on the feasibility of installing water wells at Community Park and Buckeye Fields. The sports fields at these 2 parks are our greatest consumption of landscape water and primarily for the sports fields.

Based on our meetings with several well drillers there is a high probability of successfully developing water wells at Community Park, but less likely at Buckeye Fields. Water wells options and costs will be discussed in more detail.

While it's not practical to install water wells specifically to irrigate landscaped medians and street right-of-way, water trucks and/or tankers could possibility be used to transport water from City owned wells.

- **Other Sources**

While continuing to explore and implement the installing of water wells at Community Park we will be researching the possibility of purchasing and transporting reclaimed and /or treated water from:

1. Central Contra Costa Sanitation District (CCCSD)
2. Contra Costa Water District.
3. EBMUD Sewage Treatment Facility in Oakland
4. EBMUD, Lafayette Reservoir

An application has been made for a hydrant meter from CCCSD and Joseluis will be attending a training session soon regarding the use and restriction use of reclaimed water.

I'm very confident that the cost to acquire and transport recycled water from CCCSD, CCWD or EBMUD will be much more costly than obtaining it from a well at Community Park. However if the drought should continue through 2009, and water wells don't prove to be a viable water source, it may be our only option.

Water Well Study

Per our discussion a few months ago we have been studying the feasibility and costs of construction water wells. Our efforts focused on Community Park and Buckeye fields in that these two facilities have the greatest demand for irrigation water. A number of well drilling companies were contacted and two agreed to meet with us and check out possible locations at the parks. While encouraging it was quite clear that well drilling is not an absolute science and no guarantees of finding water would be made.

On a positive note both well drillers felt there were a number of areas within the parks where they would recommend drilling. One recommended the top of the hills around the park the other the areas closer to the creeks. Based on other research we believe that the locations closer to the creeks would be the best locations, especially since they were closer to a power source and the irrigations systems.

We eliminate further consideration of construction water wells at Buckeye Fields, due to accessibility issues and the fact that the Bermuda grass turf would survive another year of drought. The turf would die back but would grow back from the root system in 2010. According

to EBMUD, after next season the drought will no longer be an issue because the Freeport Regional Water Project will be compete before the end of 2009, at which time additional water will be available from the Sacramento River.

Some key elements to developing successful landscape irrigation system supplied by water wells:

1. **Permits** – A permit must be obtained from the County prior to drilling. We have permit forms and will submit prior to drilling.

2. **Location, soils geology/topography** - Based on a field review both well drillers were of the opinion that it was very likely we would find water at several locations in Community Park, with the north end being the best potential due to the convergence of two creeks (Las Trampas & Grizzly). The ideal location would be near the sediment basin between the picnic area and Las Trampas Creek.

3. **Underground Imaging** - Prior to test drilling specialized ground imaging surveys can be performed to determine if ground water is present, this can avoid test drilling dry holes. Imaging is expected to cost between $11,500 & $14,500.

4. **Test Holes –** Test holes are drilled to determine if ground water is available and the potential yield of the well. Once the well is proved viable during the drilling process, casing is installed to drilled depth. An "air lift test" will determine the yield of the well, which will allow for the correct pump size to be selected.

5. **Depth** - The maximum depth of well would be 900-feet, due to equipment limitations and cost/size of larger drilling rigs.

6. **Yield/Recovery Rate** – Should ground water be found a test pump is used to determine the recovery rate. A draw down and recovery test pumps water from the well for a determined period of time. The volume of water pumped and the water level in the well is monitored every 10 minutes. Once the pumping has stopped the recovery of the well, or rising water level is also monitored for the same period of time.

   Using this data and applying certain calculations the exact capacity of the well can be determined. This will help determine if the well will be adequate and if more than 1-well may be needed. Both well drillers were of the opinion that local geology limited ground water supply and that all probability more than 1 well would be necessary to meet demand.

7. **Pumps - Based** on the results of the test well pumps can be designed for the irrigation system.

8. **Storage** - In most instances water is pumped to a storage facility (tank or earth pond) and pumped from there to the irrigation system. A minimum of 1-week storage is recommended, the ultimate size will be a factor or cost and the volume needed to balance

the yield of the well(s). The best location would be where the existing sediment basin located.

Attached is draft study for the installation of water wells at Community Park. The study summarizes a very detailed analysis. The summary focuses on 5-Options (A-E).

For purposes of estimating well construction costs there are a number of elements to be considered:

Stage	Description	Cost
1	Underground Imaging Analysis	$ 11,500 – $ 14,500
2	Test Wells/Wells	$ 22,050 – $ 87,000
3	Pumps	To be Determined
4	Power Supply	To be Determined
5	Recommended Storage	$ 52,000 – $ 52,000
6	Modification to Existing Irrigation	To be Determined
7	Maintenance	To be Determined

To fund just the development of 1-3 wells will require an expenditure of $11,500 to $87,000. If the ground imaging doesn't provide sufficient favorable results the project would be abandoned before any drilling with the total cost limited to $14,500. If the results of the ground imaging are favorable test wells would commence, at any time during drilling the results are not favorable the work could be terminated, in which case the total cost would be under $100,000.

If an adequate ground water source can be found and water wells developed there could be long term benefits in the form of reduced water cost and response to future droughts

Recommendations:

1. Proceed with the Ground Imaging. Fund the $14,500 from the $307,000 budgeted for Emergency Response, 011-360. *Of the $307,000 we planned to spend up to $257,000 for the St. Mary's Road & Pleasant Hill Road Slide repairs, since the contract bid price was well below the engineer's estimate we will need only about $135,000 to complete the slide repair work, leaving $122,000 that could be directed to funding the construction of water wells.*

2. Should the results of the ground imaging be favorable, obtain permits and begin test drilling at approved locations (preferred location near existing sediment ponds). *Fund $28,950, the cost of one test well, from the $307,000 in Emergency Response, 011-360.*

3. Should the results of the test wells be favorable, complete up to 3-wells, as needed for irrigation water. Fund up to $ 44,100 from the $307,000 in Emergency Response, 011-360.

4. Begin design of modifications to existing irrigation system necessary to accommodate well water, including pumps and power source. *The cost and funding source would have to be determined.*

5. Begin design of modifications to existing sediment ponds, if the selected location, or construction at an alternate site. *The cost and funding source would have to be determined.*

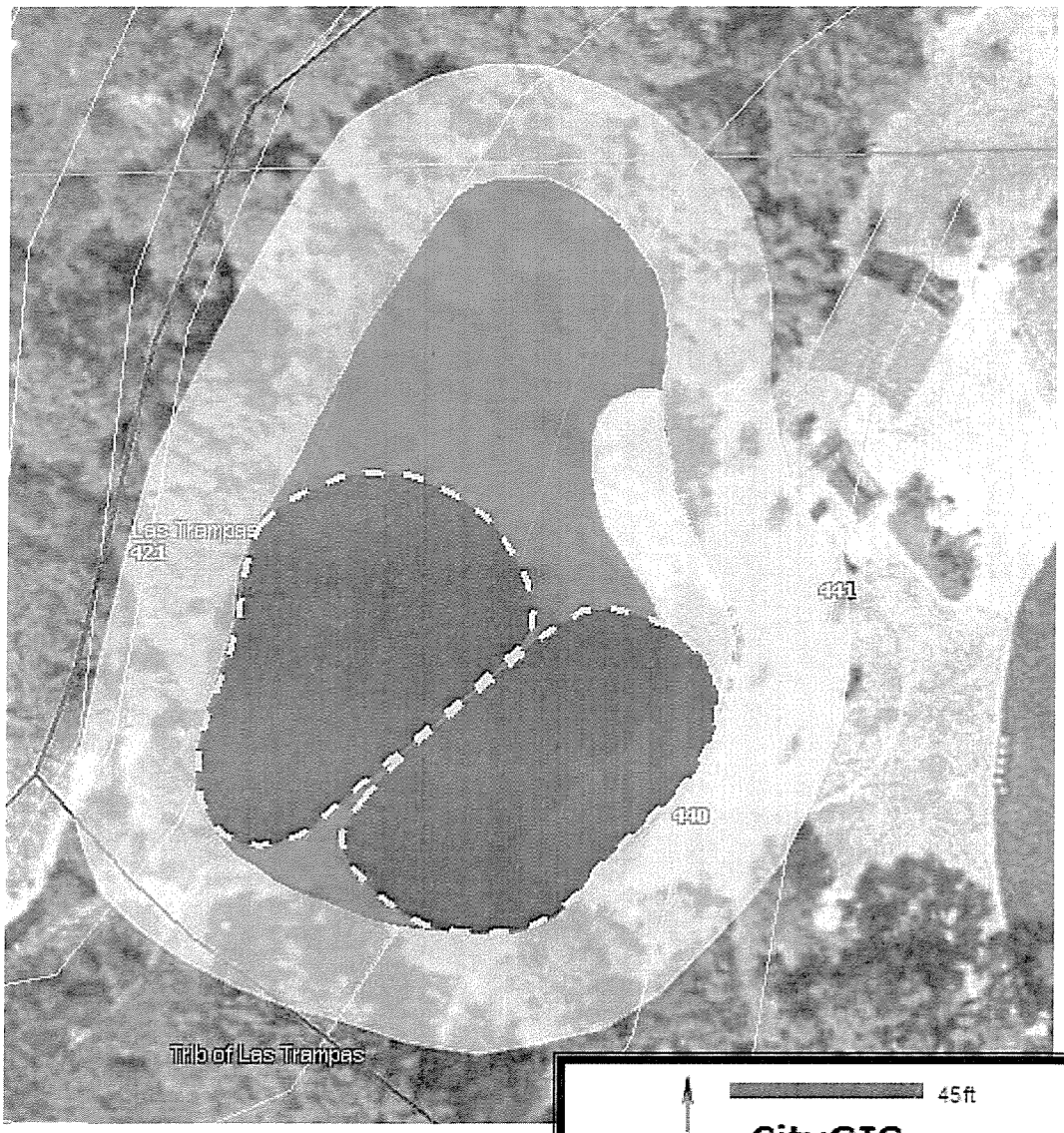
6. Should wells have sufficient yield, study the possibility of transporting water from the wells to irrigate landscaped medians and street right-of-way.

Cost Estimating

Cost estimates at this point are very preliminary and will be refined as additional information and data become available.

Attachment: Lafayette Community Park, Water Well Study

Copy: Ann Merideth, Community Development Director
Jennifer Russell, Parks & Recreation Director
Greg Travers, Parks Maintenance Specialist



FOOTPRINT (m^2)	Big	Small	Total
Current Ponds	451	421	872
New Pond	1330	218	1548

Total Expansion: 676 m^2

Expansion (%): 77.52%

STORAGE (Gal)	Big	Small	Total
Current Ponds	108,945	97,532	206,477
New Pond	452,263	21,094	473,357

Total Expansion: 266,880 Gal

Expansion (%): 129.25%

New Pond Footprint (m^2): 676 (+77.52%)

New Pond Storage (Units): 357 (+129.25%)

Lafayette Community Park

Water Well Feasibility Study

LAFAYETTE

SETTLED 1848 — INCORPORATED 1968

Prepared By: Ron Lefler, David Terhune

Date: September 15, 2008

City of Lafayette

Public Works Services

Water Well Study - Community Park

COST OF WELL DRILLING

Based on Roadrunner Drilling Quote

Element			South 1/2 Park	Entire Park
Underground Imaging Analysis			$11,500	$14,500
Test Hole Drilling Setup	1	$ 6,900	$ 6,900	$ 6,900
Well Drilling	Cost/Ft	Max. Depth		
Well Drilling	$ 24.50	900	$ 22,050	$ 22,050
Total Cost First Well			**$40,450**	$43,450

Added Cost for Additonal Wells

1	900	$ 22,050	$ 22,050
Total Cost for 2 Wells →		$62,500	$65,500
1	900	$ 22,050	$ 22,050
Total Cost for 3 Wells →		$84,550	**$87,550**

Cost Range **$40,450** → **$87,550**

Based on Martell Water Systems Quote

Element			South 1/2 of Park	Entire Park
Underground Imaging Analysis			$11,500	$14,500
Test Hole Drilling Setup			included	included
Well Drilling	Cost/Ft	Max. Depth		
Well Drilling	$ 33.33	900	$ 30,000	$ 30,000
Total Cost First Well			**$41,500**	**$44,500**

Not Available until After Ground Imaging is Complete. Above costs are approximate only and may change depending upon results of the underground imaging analysis.

NOTES: Martell Water Systems will not give us a per well estimate for test hole drilling until after the ground surface imaging analysis is completed. Roadrunner Drilling, however, has given us a full estimate and is confidently ready to start drilling test holes without the need for underground surface imaging analysis. The values used for Martell Water Systems pricing is based off of what Leroy said the average cost of a job is, and may not properly reflect the actual estimate pricing cost. Also, if initial imaging returns unpromising results, the entire project can be cancelled at that stage with a loss of $11,500-$14,500.

City of Lafayette

Public Works Services

Water Well Study - Community Park

COST OF STORAGE

Pond	Storage (units)	Footprint (acres)	Cost
Large	3,430	1.19	$ 837,000
Medium	1,521	0.79	$ 301,500
Small	721	0.45	$ 177,000
One Week Supply	248	0.12	$ 17,000

Tank	Storage (units)	Footprint (acres)	Cost
Large	2,694	0.22	$ 1,620,000
Medium	1,370	0.08	$ 890,250
Small	684	0.06	$ 597,000
One Week Supply (150,000 gallons)	201	0.02	$ 198,500

NOTES:

(1) The estimated costs for the ponds includes extremely rough estimates for soil excavation and ground work, as well as a 50% allowance for engineering, landscaping & contingencies

(2) The pricing for the storage tanks include a 50% allowance for engineering, foundation work, painting and installation.

(3) Neither prices include piping cost (4) 1-Unit = 748 gallons

-4

EBMUD WATER COSTS

Water Demand (Approx)	Units	Gallons	Current Cost per unit	Current Annual Cost (approx)
Annual	2,674	2,000,152	$3.26	$ 8,717
Peak Week Demand	**210**	**157,080**	**$3.26**	**$ 685**
Peak Day Demand	**30**	**22,440**	**$3.26**	**$ 98**

City of Lafayette
Public Works Services
Water Well Study - Community Park

COST -vs- POTENTIAL COST SAVINGS

Option	Capital Costs					Potential Annual Water Savings (base year)	Est. Average Return Period	Benefit/Cost Ratio					
		Wells (excludes. pumps, etc.)		Total				25-year Life			50-year Life		
	Storage Tank/Pond	Low	High	Low	High			Present Value of Potential Savings	Low	High	Present Value of Potential Savings	Low	High
Wells & Pond	**Option A**												
Large	$837,000	$40,450	$87,550	$877,450	$924,550	$8,717	30	$ 314,000	0.36	0.34	$ 925,000	1.05	1.00
Medium	$301,500			$341,950	$389,050		20		0.92	0.81		2.70	2.38
Small	$177,000			$217,450	$264,550		16		1.44	1.19		4.25	3.50
One Week Supply	$17,000			$57,450	$104,550		7		5.46	3.00		16.10	8.84

Note: Since in all probability it could take 2-years or more to fully implement Option A, and at best wouldn't be complete until the summer of 2009, it should be considered only on its own merits as future park project. Since refilling of the pond is greatly dependent upon rainfall it's not a viable option for the current drought. During a future drought the systems ability to meet irrigation demands would rely heavily on well productivity to refill the pond, well production will remain unknow until test wells have been developed.

Pond Only	Option B											
Large	$837,000	$0	$0	$837,000	$ 8,717	29	$ 314,000	0.37	$ 925,000	1.10		
Medium	$301,500			$301,500	$ 3,475	28	$ 125,000	0.41	$ 369,000	1.22		
Small	$177,000			$177,000	$ 1,513	32	$ 55,000	0.31	$ 161,000	0.91		
One Week Supply	$17,000			$17,000	$ 585	16	$ 21,000	1.24	$ 62,000	3.64		

Note: Due to probably time frame to implement (2-years or more), Option B, should be considered only on its own merits as park project. Since refilling of the pond is dependent upon rainfall it's not a viable option for future droughts, even if the larger pond is constructed it would provide irrigation water for just 1-year. To keep the ponds full water would have to be purchased from EBMUD (water that would be pumped into the irrigation system

Wells with Minimum Size Pond	Option C (Recommend Option)												
	$17,000	$40,450	$87,550	$57,450	$104,550	$ 8,717	7	$ 314,000	5.46	3.00	$ 925,000	16.10	8.84

Note: Option C is the most favorable and lowest cost, it can be implemented within a reasonable time period and could be in place before summer 2009. It should be noted that even if sufficient water is available initially this could be impacted by a continued drought and there is no guarantee that ground water would be available in 2009... when it would be most needed. In most water systems water from the well(s) aren't pumped directly into the irrigation system, but rather to some type of pond or tank, for the purposes of planning a small pond be included as a minimum even if constructed later. The pond could be easily expanded in the future.

City of Lafayette

Public Works Services

Water Well Study - Community Park

COST -vs- POTENTIAL COST SAVINGS

Option	Capital Costs					Potential Annual Water Savings (base year)	Est. Average Return Period	Benefit/Cost Ratio					
		Wells (excludes pumps, etc.)		Total				25-year Life			50-year Life		
	Storage Tank/Pond	Low	High	Low	High			Present Value of Potential Savings	Low	High	Present Value of Potential Savings	Low	High
Wells & Tank	**Option D**												
Large	$1,620,000	$40,450	$87,550	$1,660,450	$1,707,550	$8,717	38	$314,000	0.19	0.18	###	0.56	0.54
Medium	$890,250			$930,700	$977,800		31		0.34	0.32	###	0.99	0.95
Small	$597,000			$637,450	$684,550		27		0.49	0.46	###	1.45	1.35
One Week Supply	$198,500			$238,950	$286,050		16		1.31	1.10	#	3.87	3.23

Note: The cost of Option D exceeds the cost of replacing the sod (Option E) and doesn't warrant further consideration.

Let Turf Die & Re-sod after Water Rationing has Ended	**Option E**				
	Acres of Turf	**Turf (sq. feet)**	**N/A**	**Cost to Re-sod / sf**	**Total Cost**
	4	174,240		$3.75	$653,400

Note: Option E, should be considered only if Water Wells (Option C) proves not to be a viable option. At which time Bermuda grass would be the recommended replacement since it could survive future short term water shortages. Should the drought continue through the 08/09 season, and we are unable to develop an adequate irrigation water source from wells, Option E may be necessary by default.

Recommended Option Option C, Wells with Mimimum Size Pond (least cost and shortest return period,